AIRS CALIBRATION AND LEVEL 1B

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AIRS CALIBRATION AGENDA

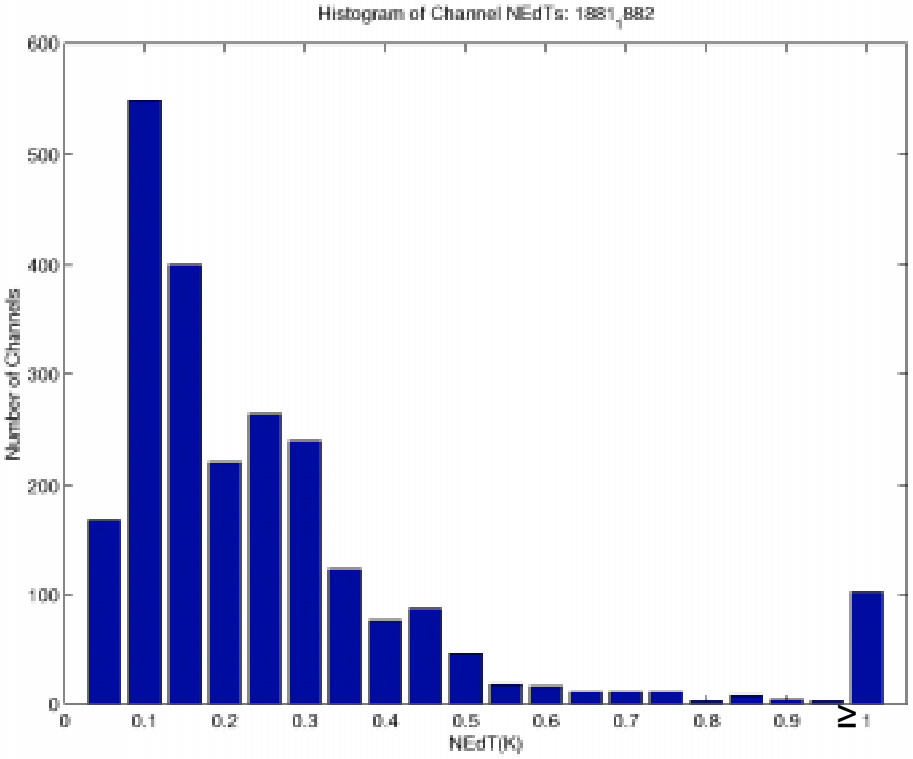
- **“Observational Errors” Those caused by instrument calibration or performance related factors**
- **Channel Selection Considerations: See this before you select your final channels**
- **Important L1B Quality Assessment Data: See this before you use L1B. We have defined very useful “flags”**
- **Post-Launch Timeline: Project activities that may affect data usefulness**

WE EXPECT LOW (<±0.2K) "OBSERVATIONAL ERRORS"

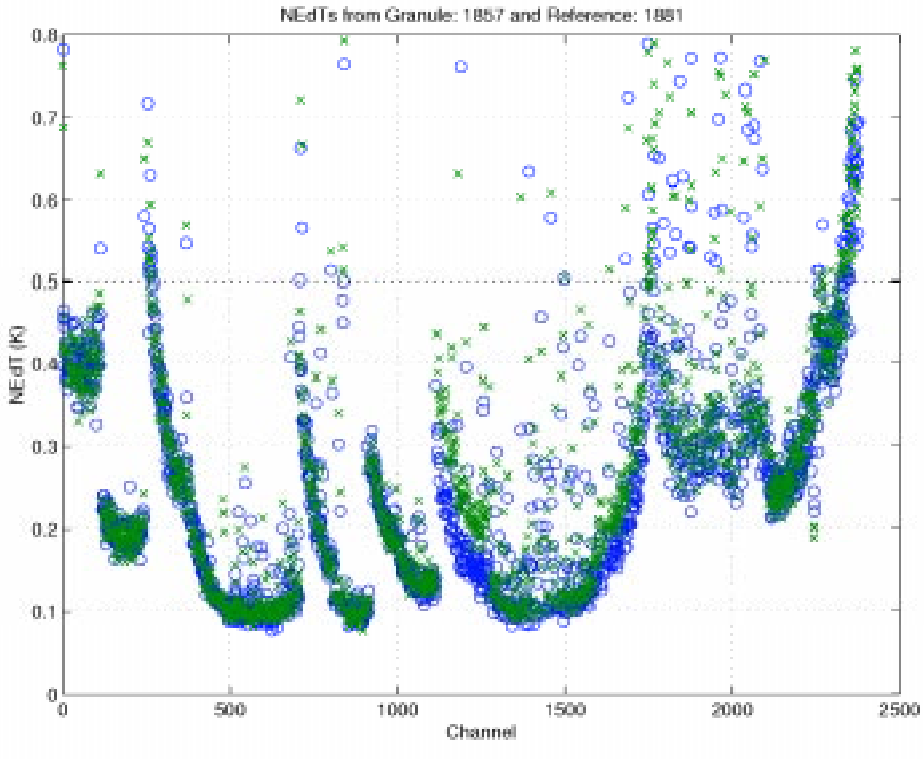
- AIRS Calibration expected to be excellent for a space based radiometer
- Steps in place to ensure calibration accuracy
  - Extensive pre-flight calibration
  - Standardized set of special test to be run throughout mission life
  - Extensive Quality Assessment generation of calibration and telemetry in the Level 1B PGE
  - Long term trending of QA indicators
  - Verification of calibration using Earth scenes in first few months of mission
- Small residual radiometric bias errors (< ±0.2K) will exist
  - Nonlinearity, scan angle dependence
- Effects of spectral errors discussed elsewhere (Strow)

MOST AIRS NEdTs ARE < 0.2K

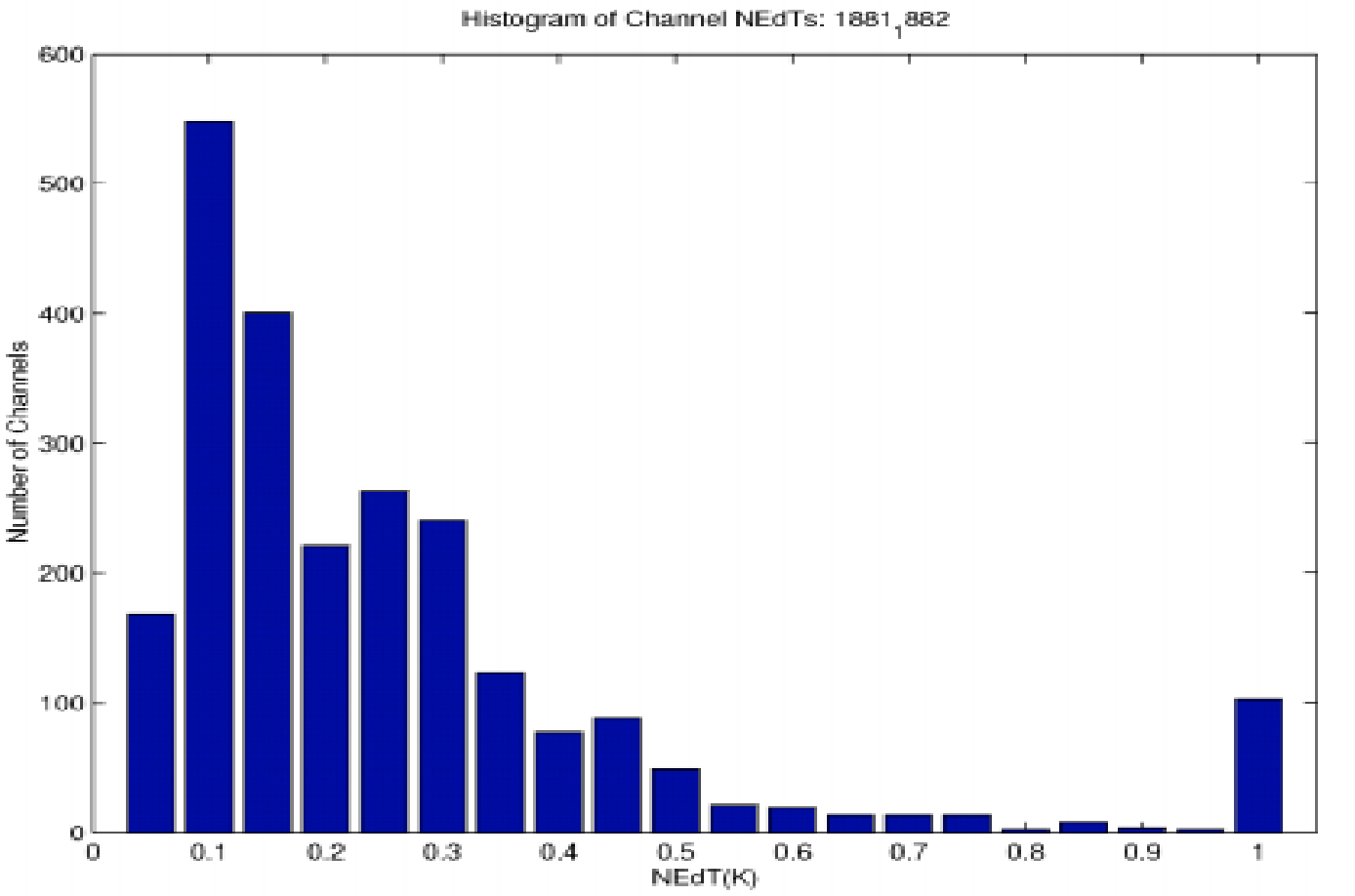
HISTOGRAM OF NEdTs PEAKS AT 0.1K



NEdTs BEST AT MODULE CENTERS



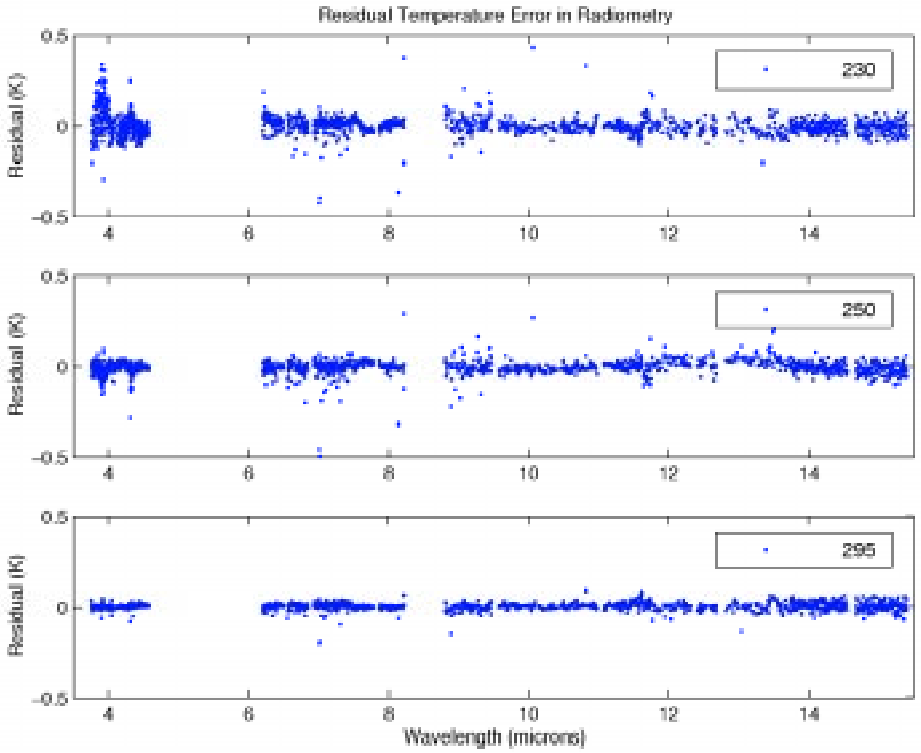
MOST AIRS NEdTs ARE < 0.2K



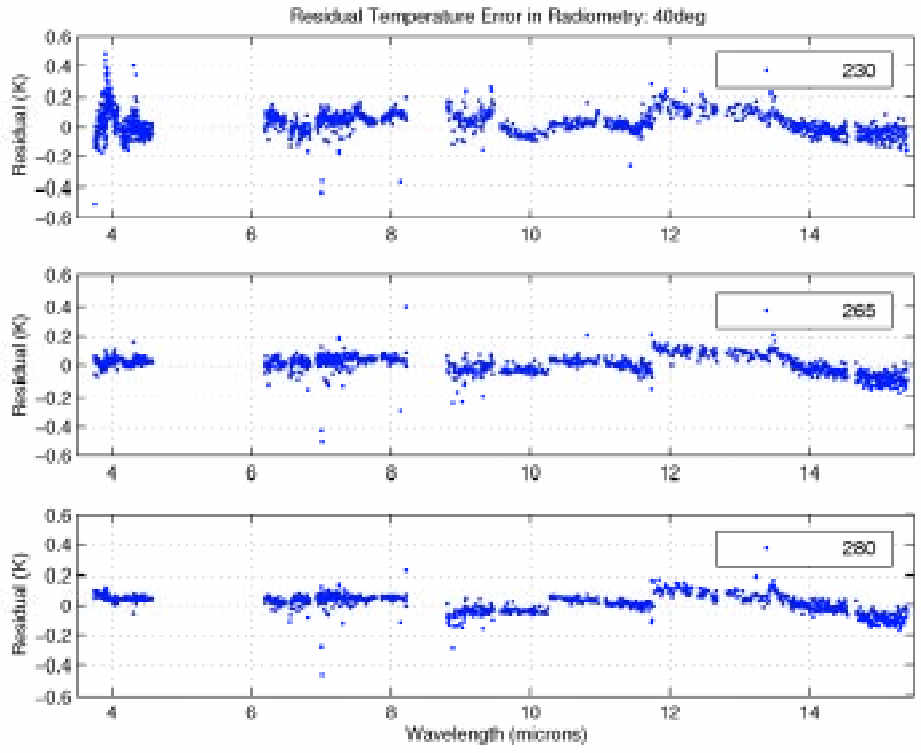
LESS THAN ±0.2K RESIDUALS EXPECTED ACROSS SCAN LINE FOR MOST CHANNELS

Derived Calibration Coefficients and Calibration Equation Applied to Test Data
Cal Coefficients include: Polarization, Tbb_offset, Gain and Nonlinearity Corrections

NADIR



40 Deg



CHANNEL SELECTION CONSIDERATIONS

CAREFUL REVIEW OF CHANNEL SELECTION IS REQUIRED

Single Scan Shows Non-Gaussian Noise Behavior in Some Channels

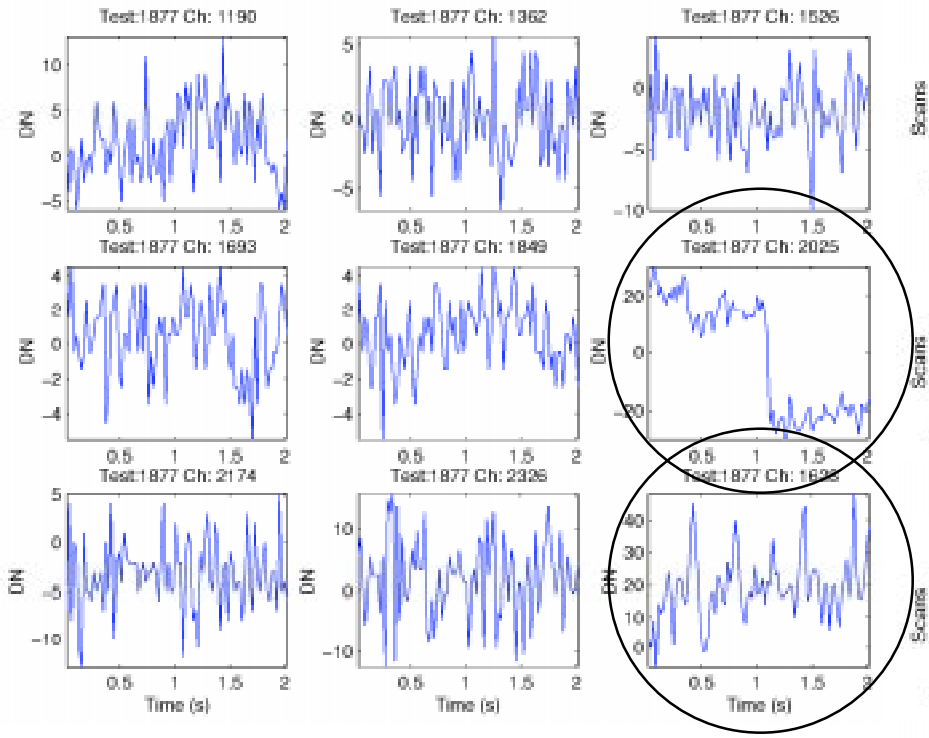
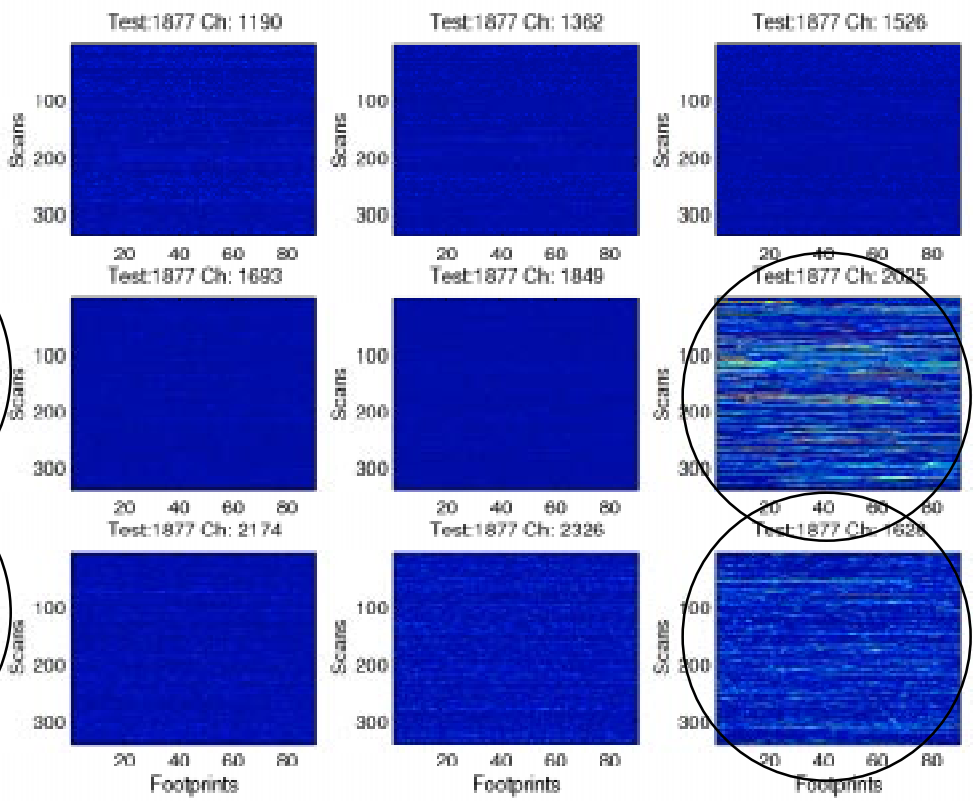


IMAGE OF TARGET (Space view with mirror stationary)



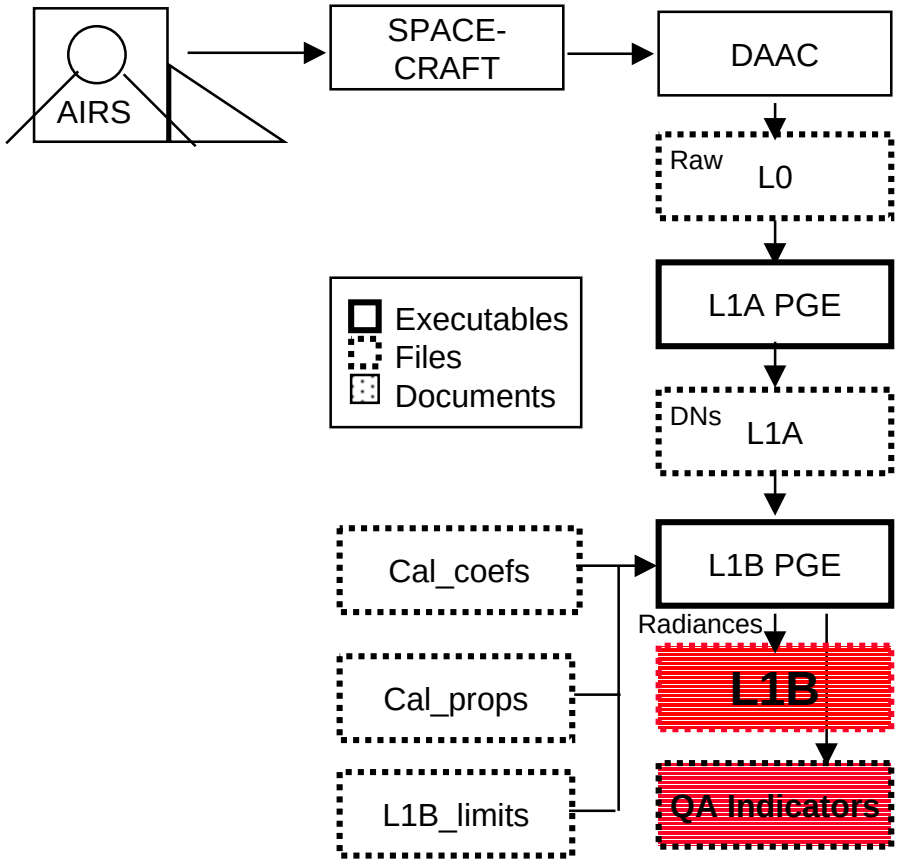
CRITICAL CALIBRATION DATA READILY AVAILABLE

- **Calibration Coefficient Files**
  - **labb_coefs.txt: a_o, a_1, a_2 preflight from the LABB with uncertainties**
  - **pol_coefs.txt: p_r x p_t and PF of AIRS**
  - **obc_emis.txt: Effective emissivity and uncertainty**
  - **spectral_coefs.txt: Spectral cwl, bw, and QA indicators**
- **Calibration Properties Files**
  - **center wavelength, bandwidth, spectral QA**
  - **expected NEΔT (K)**
  - **Non-Gaussian events observed in 14 minute period**
  - **Number of "Pops" encountered in 30,000 points**
  - **Residual calibration error (based on preflight cal as of now)**
  - **Polarization Factor**
  - **Azimuth and Elevation Pixel Centroid (deg)**
  - **AB State used in current gain file**

IMPORTANT LEVEL 1B
QUALITY ASSESSMENT DATA

AIRS LEVEL 1B DATA PRODUCT

- **AIRS L1B Product Consists of**
  - **Radiances**
  - **Geolocation Data**
  - **Quality Assessment Data**
- **Quality Assessment in L1B**
  - **Granule-level Statistics**
    - **Gains**
    - **Offsets**
    - **Noise**
    - **Spectral Frequencies**
    - **Telemetry**
  - **Scan-level Statistics**
    - **Noise**
    - **Drift**
  - **Footprint-level Statistics**
    - **Scan Angles**
    - **Cij Estimate**



SOME KEY AIRS L1B QA INDICATORS

- **STATE FIELDS**
  - **Based on the particular "mode" AIRS is in at the time**
  - **"state" = 0:Process (to L1B), 1:Special, 2:Erroneous, 3:Missing**
  - **NumXXXData: Provides counts of footprints within a granule by "state"**
- **CAL_FLAG FIELDS**
  - **Provide necessary information on the calibration**
  - **bitfield: Gains, offsets, noise events, saturation, spectral**

Summary Level	QA Name	Number Per Granule
Granule Channel Scan Scans & Channels	CalGranSummary CalChanSummary CalScanSummary CalFlag	1 N_chan N_scan N_chan x N_scans

- **Higher levels synthesized from lower levels**

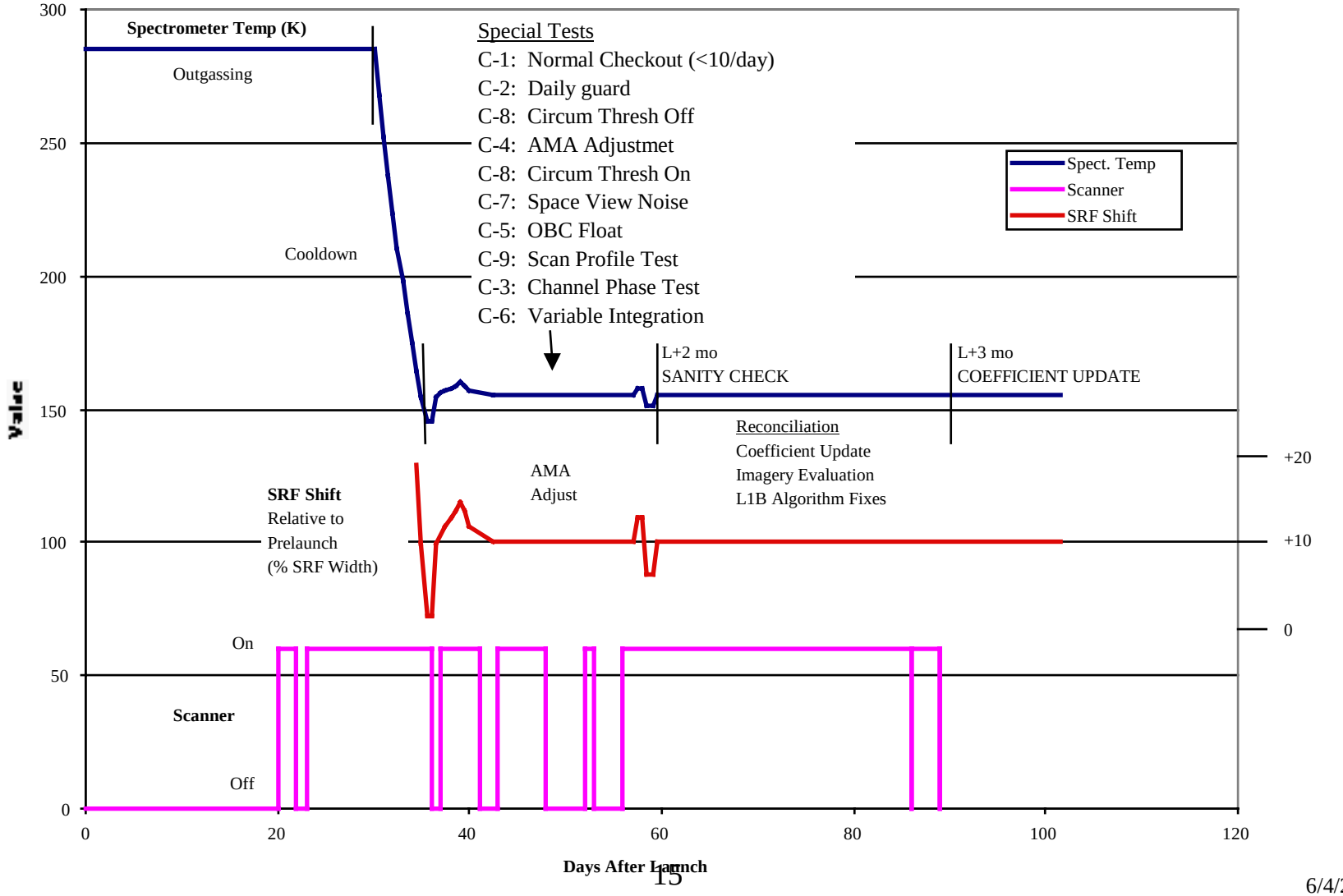
INGEST FILTERING EXAMPLE

- **Scenario**
  - **Want to assimilate entire granules of AIRS L1B**
  - **Require all footprints in the granule be scene scans**
  - **Interested only in a subset of AIRS Channels**
- **Filtering Approach**
  - **Make sure the instrument is in normal scanning operation**
    - **NumTotalData = NumProcessData**
  - **Verify that the channels of interest are well calibrated**
    - **CalGranSummary = 0 (Quick and Dirty)**
    - **CalChanSummary = 0 for all channels of interest**

POST-LAUNCH TIMELINE FOR CALIBRATION

- **L+2 Months: Activation and Special Tests Complete**
- **L+3 Months: First Look at Calibration Complete**
  - **Special Test Data Analyzed**
  - **Quicklook at Earth Scene for Calibration**
  - **Calibration Coefficients Updated**
  - **Test data set for one entire day acquired**
  - **Instrument reasonably stable after this point. Software not yet stable**
- **L+4 Months: Requirements for L1B Updated**
- **L+5 Months: Update to L1B implemented at the TLSCF**
  - **Level 1B Software should be reasonably stable after this point**
- **L+7 Months: Update to L1B at the DAAC**

ACTIVATION AND EVALUATION PHASE
TAKE UP FIRST THREE MONTHS AFTER LAUNCH



6/4/2001

FOR MORE INFORMATION...

- **"AIRS Level 1b Algorithm Theoretical Basis Document (ATBD) Part 1 (IR)", H. Aumann, et. al.**
- **"In-Flight Calibration Plan", AIRS Calibration Team, May 2001, JPL-D-18816 Version 2.0**
- **"L1B_AIRS_QA Interface Specification Interface Specification Version 2.1.5.1", May 7, 2001**
- **"Atmospheric Infrared Sounder Quality Assessment Plan," E. Fetzer editor, Version 2.0**

- **All documents are available on the AIRS project website or directly from the AIRS project office.**